

APPENDIX B

Tables Comparing Alternative Manure Treatment Technologies

Each treatment technology or unit process must be evaluated individually on the basis of constituent removal, constituent conservation, gaseous effluent, and cost. New or adapted unit processes can be used in a variety of ways, but performance of the total treatment system implemented is the end goal. In general, the cost and performance of sequencing of unit processes into a total system varies and is not well known at present. Therefore, the performance and cost of individual unit processes or manure treatment components are described in Table 25B-1 to facilitate comparison of alternative treatment processes and the selection of those processes most likely to meet an individual manure management need.

Table values are based on unit process operation according to recommended practices such as location, sizing, loading, operation, and maintenance recommendations for lagoons. They are relative and may change depending on unit type and operation.

Table 25B-1. Constituent removals from liquid stream by various treatment units.

Treatment Unit	Organic Material	N	P	Heavy Metals	Pathogens
High-rate aeration	M+	M-	M-	No	M+
Low-rate aeration	M-	M-	M-	M-	M+
Lagoon with high-rate aeration retrofit	M+	M-	M-	No	M+
Lagoon with low-rate aeration, aerobic/anaerobic zones retrofit	M-	M+	M-	M-	M+
Solids removal, mechanical	M+	M-	M-	M-	M-
Solids removal, gravity	M+	M-	M-	M-	M-
Chemical precipitation	M+	M-	M+	M+	M-
Lagoon	M+	M+	M+	M+	M+
Lagoon with impermeable cover	M+	N	M+	M+	M+
Lagoon with permeable cover	M+	M-	M+	M+	M+
Anaerobic digester with gas collection	M+	No	No	No	M+
Aerobic biofilter	M+	M-	M-	M-	M+
Constructed wetlands	M+	M+	M-	M+	M+
Sequencing batch reactor	M+	M+	M+	M+	M+
Land application	M+	M+	M+	M+	M+

Key: M+ = Major removal
 M- = Minor removal
 No = Little or no removal

Table 25B-2. Gaseous effluent from various treatment units.

Treatment Unit	Effluent Gas			Odor	Cost		Full-Scale, On-Farm Testing
	CH ₄	NH ₃	H ₂ S		Initial	Operating	
High-rate aeration	M-	M-	M-	M-	H	H	Yes
Low-rate aeration	S-	S-	S-	S-	I	I	Yes
Chemical precipitation	N	N	N	N	H	H	No
Solids removal, mechanical	M-	M-	M-	M-	H	I	Yes
Solids removal, gravity	M-	M-	M-	M-	I	L	Yes
Land application	S+	S+	S+	S+	I	I	Yes
Lagoon	M+	M+	M+	S+	L	L	Yes
Lagoon with permeable cover	M-	M-	M-	M-	H	L	Yes
Lagoon with impermeable cover	M-	M-	M-	M	I	L	Yes
Lagoon with high-rate aeration retrofit	M-	M-	M-	M-	H	H	Yes
Lagoon with low-rate aeration, aerobic/anaerobic zones retrofit	S-	S-	S-	S-	I	I	Yes
Aerobic biofilter	M-	M-	M-	M-	H	H	Yes
Anaerobic digester with gas utilization	M-	M-	M-	M-	H	H	Yes
Constructed wetlands	M-	M-	M-	M-	I	L	Yes
Sequencing batch reactor	M-	M-	M-	M-	H	H	No
Composting, aerated	M-	M-	M-	M-	I	I	Yes
Composting, unaerated	M-	M-	M-	M-	L	L	Yes
Vermicomposting	M-	M-	M-	M-	I	I	Yes

Gas: M+ = Major increase S+ = Minor increase
M- = Major decrease S- = Minor decrease
N = No effect

Cost: H = High
I = Intermediate
L = Low

Table 25B-3. Potential recovery/conservation of constituents during operation of various treatment units.

Treatment Unit	Organic Material	N	P	Heavy Metals
High-rate aeration				
Liquid stream	M -	M +	M -	M +
Solid stream	M +	M +	M +	M +
Lagoon with high-rate aeration retrofit				
Liquid stream	M -	M +	M -	M +
Solid stream	M +	M -	M +	M +
Low-rate aeration				
Liquid stream	M -	M -	M -	M -
Solid stream	M +	M -	M +	M +
Lagoon with low-rate aeration, aerobic/ anaerobic zones				
Liquid stream	M -	M -	M -	M -
Solid stream	M +	M -	M +	M +
Lagoon				
Liquid stream	M -	M -	M -	M -
Solid stream	M +	M -	M +	M +
Lagoon with cover				
Liquid stream	M -	M +	M +	M -
Solid stream	M +	M +	M +	M +
Solids removal, mechanical				
Liquid stream	M -	M -	M -	M -
Solid stream	M +	M +	M +	M +
Solids removal, gravity				
Liquid stream	M -	M -	M -	M -
Solid stream	M +	M +	M +	M +
Aerobic biofilter				
Liquid stream	M -	M +	M -	M -
Solid stream	M +	M -	M +	M +
Anaerobic digester with gas collection				
Liquid stream	M -	M +	M +	M -
Solid stream	M +	M +	M +	M +
Sequencing batch reactor				
Liquid stream	M -	M -	M -	M -
Solid stream	M +	M -	M +	M +
Constructed wetland, liquid stream	M -	M -	M -	M -
Land application, liquid stream	M +	M +	M +	M +
Composting, aerated, solid stream	M +	M +	M +	M +
Composting, unaerated, solid stream	M +	M +	M +	M +
Vericomposting, solid stream	M +	M +	M +	M +

M + = Major potential
M - = Minor potential